

Notes from the Solar System Telecon March 27, 2006

Dear NGAO-Solar System members,

Thanks for attending the telecon. Find below an updated summary of our progress and several action items to finalize the Science cases.

I propose to have our next telecon on April 10 at 2pm PST. Let me know if you are not available. See you Thursday at UC Santa Cruz

Regards,

Franck M.

Notes from the Solar System Telecon

attendees: , A Bouchez, J. Emery, M. Adamkovics, F. Marchis

Absent: K. Noll

We discussed the progress made in each science cases (~45 min).

J. Emery, A. Bouchez & F. Marchis will attend the CfAO working group.

M. Adamkovics may attend it by videoconferencing.

Action items not related with any science cases:

Keith: will send us a short email with his thoughts and comments about science requirements (see email sent on March 1, 2006 by Franck)

Antonin: Will send us a short email with his thoughts and comments about science requirements (see email sent on March 1, 2006 by Franck)

SCIENCE CASES:

A. ----- Multiple Asteroidal Systems -----

- A.1 Sylvia multiple system is in progress (Franck)

the orbital element of the moons are set. Movie & first images are available

<http://astron.berkeley.edu/~fmarchis/document/KNGAO/SylviaProject/>

The images considering also NFAO-no tip-tilt are NOW available, comparison between NIRC2, NGAO R & V and HST is progress

Gain with NGAO:

- greater chance to detect the moons (not yet quantify)

- better photometry (not yet quantify)

- better astrometry (factor of ~4 in NIR, factor of ~6 in visible)

=> better accuracy on the orbital parameters (can we see some low order effects? wobble of orbit due to precession, forced eccentricity by resonance?)

action item Franck: finalized the estimate of the orbital parameters and the precision (in progress)

- A.2 2003EL61 and its 2 moons (Antonin)

Antonin sent a write-up (attached). Surprising conclusion: MCAO and MOAO might be optimal for this sort of science because of better sky coverage (so more systems can be studied). The rate of detection is similar to NGAO. Antonin will get inputs about sky coverage with MOAO/MCAO from Chris.

action item for Antonin: Send Franck the slides/table/materials for workshop presentation

- A.3 Size and Shape of Asteroids (assigned to **Josh & Keith**)

I requested to have the SR and FWHM of NFAO PSF together in a table to simplify this task. Peter, We need to better know the relation between residual blurring <-> magnitude. something like

$mv < 16$ - no blurring

$16 < mv < 18$ - 8 mas

$18 < mv < 19$ - 15 mas

$mv > 19$ - 25 mas

Progress email from Josh Emery

"Quick summary of asteroid imaging science case before I head off to the afternoon sessions:

I computed best-case brightnesses and angular sizes for asteroids in the Main Belt, Trojan swarms, Centaur region, Kuiper Belt by assuming they would be viewed at perihelion and opposition. I assumed no blurring at $V < 15$ (is this right, or will there be blurring at that brightness?) and that we needed to get 3 pixels on the object to call it "resolved". Using these assumptions, I found that about 450 Main Belt asteroids would be resolvable in the visible (only 16 at K-band), 5 Trojans (0 at K-band), 1 Centaur, and 3 KBOs (the big ones - UB313, EL61, and FY9). This includes unnumbered as well as numbered objects.

I'll send a more detailed (and prettier) summary next week sometime."

Additional details: radiometric diameter from IRAS was used when available.

If not, the diameter was estimated from H and assuming different albedo.

$A(\text{main-belt})=13\%$, $A(\text{Trojan})=4\%$, $A(\text{Centaur})=7\%$, $A(\text{TNO})=12\%$

action item for Josh & Keith: Send Franck the slides/table/materials for workshop presentation.

How many IRAS measurements are available? (I guess you use Bowell table right?)

* A.4 Spectroscopy of moonlets (assigned to **Josh & Franck**)

we need to generate images and have a better idea about the stability of PSF.

Scientific justification: What kind of absorption features can we expect for asteroid surfaces (C,S, M, V taxonomic types) in the NIR, and in visible. Do we need the short wavelength visible range (<0.7 microns). What is the most adequate spectral resolution?

Progress in scientific justification can be made.

action item for Josh : send to Franck references containing spectra taken in visible+NIR. We will discuss about it during the workshop.

B. ----- Titan and other Giant Planet satellites -----

- B.1. Titan surface and atmosphere (assigned to **Mate & Franck**)

Titan image are generated & convolved to simulate different instruments and wavelength of observations.

You can see the images on

Based on simulated consideration the SSI albedo map in visible + low altitude haze and convolved using NFAO-no tip-tilt blurring PSF (Mate & Franck)

see for instance preliminary result (no noise added yet)

* comparison Keck NGS, Keck XAOPI (PSF from Bruce), Keck NFAO

http://astron.berkeley.edu/~fmarchis/document/KNGAO/Titan/simu_titanH_OA.jpg

* Titan surface observed in several wavelength (at $\lambda < 0.75 \mu\text{m}$ the surface cannot be seen)

http://astron.berkeley.edu/~fmarchis/document/KNGAO/Titan/simu_titan_NGAO.jpg

* comparison HST/ACS-HRC vs KNGAO in R band

http://astron.berkeley.edu/~fmarchis/document/KNGAO/Titan/simu_titan_compHST.jpg

Mate transposed existing features to make a new one. The fits file is ready.

ed a surface feature Discussion during March 15 telecon:

Question: What kind of surface changes?

Josh pointed out that flow change (70 km wide and 200-300 km long) could be a typical surface changes on Titan (LPSC: reference?)

Question: surface can be seen at $< 0.9 \mu\text{m}$?

Mate confirmed that the surface of Titan can be detected at $0.6 \mu\text{m}$

reference (Richardson 2004)

[http://adsabs.harvard.edu/cgi-bin/nph-](http://adsabs.harvard.edu/cgi-bin/nph-bib_query?bibcode=2004Icar..170..113R&db_key=AST&data_type=HTML&format=&high=4417293d3125795)

[bib_query?bibcode=2004Icar..170..113R&db_key=AST&data_type=HTML&format=&high=4417293d3125795](http://adsabs.harvard.edu/cgi-bin/nph-bib_query?bibcode=2004Icar..170..113R&db_key=AST&data_type=HTML&format=&high=4417293d3125795)

Question: Titan up to $5 \mu\text{m}$? (assigned to Antonin)

Do we have any good justification to request superNIRC2 up to $5 \mu\text{m}$ for Titan?

Antonin pointed out that Titan cannot be easily observed with NIRC2 b/c of thermal background. mL and mM of Titan? We will need a cold instrument?

Josh pointed out that 2 bright spots were detected on the surface of Titan (LPSC

conference, <http://www.lpi.usra.edu/meetings/lpsc2006/pdf/2319.pdf>), no idea about their composition, not correlated with albedo feature

Mate pointed out that the bright spot brightness is not dependent of the phase angle suggesting a surface feature?

Question: Franck proposed to also envision the gain of Polarimetric analysis for Titan $5 \mu\text{m}$ bright spot? (assigned to Antonin and Mate?)

Action item for Franck: convolve the image of Titan with Surface feature and make a comparison

Action item for Antonin: Titan up to $5 \mu\text{m}$?

- B.2 Io image in sunlit is also ready (**Franck**)

preliminary result (no noise)

* Io observed in visible and NIR with KNGAO

http://astron.berkeley.edu/~fmarchis/document/KNGAO/Io/simu_io_NGAO.jpg

* comparison with HST in R band

http://astron.berkeley.edu/~fmarchis/document/KNGAO/Io/simu_io_compHST.jpg

Question: Off-axis PSF. We will wait the Working group meeting to see what the other groups did.

action item for Franck: Prepare Io in eclipse observation.

B.3 Observations of smaller Giant Planet satellites (assigned to Josh & Mate))

Mate sent a table with angular size of the satellites (on March 15)

Franck proposes to add several column such as angular separation from the main planet, apparent magnitude in visible & comments.

Antonin suggest to consider high spectral analysis ($R > 1000$) for these satellites. For instance detection of molecules in geyser jets of Enceladus, Io, and Triton

action item for Josh and Mate: Prepare the table (before the workshop?), Think about what kind of molecules could be detected in the faint atmospheres of active satellites?